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POLYSIPHONIA AND RELATED GENERA IN THE CENTRAL AND WESTERN TROPICAL PACIFIC OCEAN

George J. Hollenberg [1]

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Polysiphonia is a genus of red algae world-wide in distribution. It is one of the largest in number of species. In the colder waters of New England and of Southern Australia, certain species may be 10-12 inches high. In the tropical Pacific Ocean they are mostly minute, with certain species being rarely more than a few millimeters in height. It has been suggested that this might be an adaptation to a shortage of micronutrient minerals or organic micronutrients as a result of great distances from large land masses.

My interest in Polysiphonia began about 1935 when I became aware of the fact that no one seemed to be able to identify the species along the California coast. This was somewhat of a challenge and in a few years two papers were published dealing with the species along the Pacific Coast of North America from southern British Columbia to Mexico. A later paper described the species found along the Pacific Coast of Mexico and more recently the Peruvian species were treated in a publication by E. Y. Dawson. A semester's sabbatical leave during the fall of 1962 marked the beginning of the present study, which has been continued with the support of a research grant from the National Science Foundation.

Polysiphonia is a very representative member of the Rhodomelaceae family. This family is said to include more genera than all the other families of Rhodophyta combined. Like most members of the family it is polysiphonous in structure. This term refers to the fact that the branches are composed of segments cut off from an apical cell, each segment dividing longitudinally forming four or more tube-like cells surrounding a central cell -- hence "polysiphons" or polysiphonous. In Polysiphonia the number of "siphons," known as pericentral cells, is more or less constant for a given species.

In additional ways the vegetative features of Polysiphonia and related genera are dependably characteristic for a given species. Hence such vegetative features are very important taxonomically, whereas reproductive structures in these genera exhibit relatively little variability. For example, the branches may be exogenous in origin (arising before the formation of pericentral cells in a given segment) or endogenous (arising from the central cell after the pericentral cells have been cut off in that segment). The nature of

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branches, whether determinate or indeterminate in growth, and the symmetry of branching, whether radial, bilateral, or dorsiventral, are likewise important taxonomic features. Also important are the details concerning the nature and arrangement of the hair-like structures known as trichoblasts and the origin and structure of rhizoids.

Much of the confusing synonomy and exasperatingly vague and inadequate descriptions of new species could have been avoided if more attention had been given to these details, the taxonomic importance of which was pointed out as early as 1901 by Falkenberg and others.

At least 30 species of Polysiphonia occur in the central and western tropical Pacific Ocean, of these all but three have been collected in the Hawaiian Islands. Four are known chiefly or exclusively in sheltered water of harbors and similar locations and three commonly occur in ponds and in the mouth of streams in water of very low salinity. Only one has an outer (cortical) layer of cells obscuring the pericentral cells, a feature common in Atlantic species.

For many years it has been known that certain species of genera of marine algae are common to the West Indies and the Indo-Pacific region. Hence, it is interesting, but not surprising to find that 8 of the species of Polysiphonia found in the central and western tropical Pacific area occur also in the region of Bermuda, Florida, and the West Indies.

Of equal interest, but again not surprising, in view of the work of Dawson on marine algae of the Pacific coast of Mexico, is the observation that 6 species are common to the central and western tropical Pacific area and to the Pacific Coast of Mexico.

Four of the species found in Hawaii are very widely distributed in tropical waters from the West Indies across the Pacific to the Indian Ocean. At least one of these, P. howei, is probably related to such factors as ocean currents and temperature barriers.

Since the genus Polysiphonia is world-wide in distribution, since certain species have a very wide distribution, and since the species mostly have structurally precise features, further studies concerning distribution of the species should prove very valuable.

During the progress of this study 11 seemingly new species of Herposiphonia were found to occur in the area of study. Only about 20 species of this genus have been previously described.

Five or six new genera will be added to the family of Rhodomelaceae as a result of this study. One of these is a minute parasitic genus of interest because it represents an unusual case in which a red alga is parasitic on a brown alga, whereas most parasitic red alga parasitize members of their own family.

CONSERVATION AND THE HAWAIIAN BOTANICAL SOCIETY

A DISCUSSION OF CONCEPT

D. Mueller-Dombois *

If the members of our Society were asked individually to briefly formulate their ideas and expectations which they would connect with their Society membership, the answers would probably vary considerably. Our common interests are the plants, but we value these from many different viewpoints. A strong element in our Society is the appreciation of plants for their aesthetic and ornamental values. This is a most worth-while end in itself; but beyond this, it also reflects a philosophy of life. People that appreciate plants as ornamentals will also readily appreciate plants in their often unornamental natural state. And the concept can readily be expanded to a broader interest in all our natural resources as something that should be treated with the utmost care and responsibility.

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Assistant Professor of Botany, University of Hawaii

There are also members in our Society, whose interests are primarily in the economic use of plants, and again, others whose interests are mainly scientific. The latter, in particular, can utilize many different approaches. There is, for example, the organism-specialized botanist who may be primarily interested in micro-plants such as bacteria, fungi, or algae. There are also botanists who are primarily concerned with molecular structure and cellular functions. To them, the plant type is important only as experimental material and the plant as a whole organism is as yet considered too complex a material for many functional problems.

Such a brief discourse into scientific botany may help to destroy the popular image of the botanist as the one who collects, names, and knows plants. It would be an even greater misconception, however, to think that modern botany has done away with the latter aspect. The necessity of knowing plants is here to stay, in fact, modern botany aims at knowing the plants even better.

In summarizing some of the diversification of botanical viewpoints among our membership, I wish to emphasize the role of our Society in permitting idea-exchange on all aspects of botany under a unifying concept.

One of the unifying concepts was already pointed out; that of considering our natural resources as values which deserve our utmost care and responsibility. This, as such, is a vague concept, and it only represents an attitude of thought. However, it can be formulated, as I see it, in two ways: (1) on the aesthetic level, and (2) on the scientific level.

1. The subject of conservation on an aesthetic level is readily appreciated by most Society members and was recently manifested again in our participation in the Mayor's Beautification Council.

2. I wish to take this opportunity of adding a scientific viewpoint of conservation. Conservation of natural resources is not simply preservation and non-use. Conservation is resource-use based on sound biological principles. However, these principles are usually not satisfactorily known before our natural resources are put to use. As a rule, the botanical resource in the form of the natural plant cover is the first to disappear upon use, and commonly little argument other than its aesthetic value (which is sometimes questionable) is put forth to stop total discard. A realistic approach to our dilemma of having to eventually destroy most parts of our natural environment is to preserve limited tracts of natural or unmanaged plant covers with their environments ("ecosystems") in all macroclimatic zones. Such representative, natural ecosystems would serve two important functions:

a. Current field research shows increasing evidence that such ecosystems represent practically inexhaustible resources of knowledge. This is so because our previous knowledge of the natural plant cover and its specific environments has only been very superficial, or one-sided. Therefore, we should not discard our assets of hidden knowledge, before they are fully exploited.

b. Representative, natural vegetation - land segments serve as "controls" or "yardsticks" for evaluating any modification induced by management, whether good or bad. In this sense, their function is the same as that of "blanks" used in many biological experiments. Concurrently with management of the broader utilized area, improved methods can be derived from a better understanding of the biological principles active under natural conditions.

NEWS AND NOTES

HAWAIIAN SUGAR PLANTERS' ASSOCIATION EXPERIMENT STATION (LGN): Dr. Andrew Maretzki joined the staff of the Physiology and Biochemistry Department as Associate Biochemist. He comes to Hawaii from the Puerto Rico Nuclear Center and the School of Medicine in San Juan. After attending elementary and high schools in Germany and England, he attended the University of Hawaii and the University of Cincinnati, receiving his BS from the latter in 1952. He received his master's in 1958 and his doctorate in 1960 from Pennsylvania State University.

One of Maretzki's first projects will be the study of yield decline, a perplexing problem of declining yields with continuous propagation in the same location.

PINEAPPLE RESEARCH INSTITUTE OF HAWAII (JBS): George Yamane, formerly Research Superintendent for the Dole-Lanai Pineapple Plantation, joined the staff as Horticulturist. He is also serving as Acting Head of the Physiology and Soils Department. Yamane received his BS in 1958 and his MS in 1960 from the University of Hawaii.

PLANT QUARANTINE DIVISION, ARS, USDA (ETT): Frank Larsen, originally from Idaho, will transfer to Travis Air Force Base, California, in the very near future. He has been at the port of Honolulu for four years. Joining the Honolulu port after completion of the basic training course at the Plant Quarantine Training Center in New York are Edmund Uyeda and Arnold Perkins. Uyeda is from Hawaii, while Perkins is a retired Air Force officer.

Earl T. Ozaki was promoted from PQ Inspector to Port Pathologist. He was formerly Port Pathologist of the port of New York before his transfer to Honolulu. Jules Fine, formerly Honolulu Port Pathologist, is now the Domestic-Maritime Supervisor.

UNIVERSITY OF HAWAII:

Department of Botany (AKC): "W" Jan Newhouse was appointed Acting Assistant Professor for the spring semester. He is currently teaching Phycology (Bot 480) and Chlorophyta (Bot 681). He attended Boston University, Dartmouth College (BS, 1949), University of New Hampshire (MS, 1952), and the University of Hawaii. He has participated in research projects in the Tuamotus, Kapingamarangi, and Johnston Island. Newhouse was with the Dole Corporation as an Analyst and Technologist.

Department of Horticulture (RMW): Visitors have included Dr. William Furtick, Professor of Agronomy, Oregon State University, and President of the Weed Society of America; and Dr. Harry C. Haines, North Carolina, a specialist in forest management, who was returning from a mission to Indonesia for USOM.

Masanobu Tara of Hiroshima University in Japan is a recent addition to the station staff. He is a Research Assistant in Horticulture, and will be working with Dr. H. Kamemoto.

HAMAKUA DISTRICT DEVELOPMENT COUNCIL, INC. (PQTomich): Efforts of the Council to preserve the area's last remaining natural woods tract has resulted in the establishment of Kalopa Forest State Park. The park will consist of 615 acres, of which 100 acres are native forest with large 'ohi' a-lehua trees. Development of the area as a state park begins at the end of March, with a site survey and layout of the first increment for development. Plans call for improvement of access roads and trails, selective clearing and planting, and construction of visitor accomodations -- picnic areas, camp sites, cottages and dormitories.

The efforts of the Council for preservation of this local area began three years ago with a community drive when the area was being considered for future sugar cane growing. It was concluded with a final inspection of the site and discussions with the Council to outline preliminary plans earlier last month.

BOOKS OF INTEREST

HILLEBRAND, W. 1888. Flora of the Hawaiian Islands. (1966 reprint). New York: Stetchert-Hafner ($20.00).

MILLER, CAREY D., KATHERINE BAZORE, & MARY BARTOW. 1965. Fruits of Hawaii. 4th ed. Honolulu: University of Hawaii Press. ($4.50).

NEAL, MARIE C. 1965. In Gardens of Hawaii. Rev. ed. Honolulu: B. P. Bishop Mus. Spec. Pub. 50. ($15.00)

BOTANICAL SOCIETY NOTES

New Members: Norman K. Carlson, Kealakekua, Hawaii (Jan.); Dr. Noel P. Kefford, Department of Botany, University of Hawaii, and Paul R. Schutz (Feb.).

Membership Committee: Dr. Robert Warner, (Chairman), Department of Horticulture, University of Hawaii; Dr. George W. Gillett, Department of Botany, University of Hawaii; and Miss Beatrice Krauss, Pineapple Research Institute.

Society Speakers: (January) "Observations Concerning the Distribution of Polysiphonia and Related Genera," Dr. George Hollenberg, Professor Emeritus of Biology, University of Redlands (Calif.) and Visiting Researcher, Dept. of Botany, University of Hawaii; (February) "Citrus Ecology in Japan," Dr. Robert M. Warner, Department of Horticulture, University of Hawaii; (March) "Grasses -- An Agronomist's View," Dr. Peter Rotar, Department of Agronomy and Soil Science, University of Hawaii.

A recent newspaper article in the Honolulu Star-Bulletin was taken almost entirely from Russell LeBarron's article on Eucalyptus (The Use of Eucalypts in Hawaii, Hawn. Bot. Soc. Newsltr. IV(3):14-16, June 1965).

HAWAIIAN BOTANICAL SOCIETY MEETING

DATE : Monday, April 4, 1966, 7:30 p.m.

PLACE : Agee Hall, Experiment Station of the Hawaiian Sugar Planters' Association (HSPA) 1527 Keeaumoku Street, Honolulu

SPEAKER: Dr. Melvin L. Bristol, Visiting Assistant Professor of Botany, University of Hawaii

SUBJECT: "Native Andean Food Plants" (Illustrated)

Dr. Bristol came to the University of Hawaii in January 1966 after an extensive career at Harvard University which covered his undergraduate as well as graduate work, and culminated in a Post-Doctoral Fellowship in Economic Botany. His interests in the New World tropics began with a year as an exchange student in Brazil before he went to Harvard. He has also had field experience in the Himalayas and East Pakistan, Cuba, Colombia, Chile, and Bolivia. His latest work in Colombia extended over some 15 months when he was studying food plants and all aspects of the ethnobotany of the Sibundoy Indians. (GEB)

FIELD TRIP

In addition to the traditional summer field trip on Oahu, for which plans are under way, there will be an opportunity to arrange for a field trip to Hawaii Volcanoes National Park this summer. The purpose of this trip would be to introduce you to the ecological aspects of the vegetation in the Park. The trip would include a visit to the timber line on Mauna Loa (at 8,000 feet), where silversword can be seen in its natural habitat; a visit to the sub-alpine parkland, kipukas, rain forest, seasonal forest, desert, coastal lowland vegetation from arid to humid area; and an overview of primary plant succession on lava flows.

It is thought that this arrangement will be worthwhile if 10-30 people show an interest in participating. The time schedule and approximate cost would be as follows:

Leaving Honolulu, Aloha Airlines, 6:00 a.m., Saturday, July 2nd;

Leaving Hilo, Aloha Airlines, 8:00 p.m., Monday, July 4th;

Cost of round trip $30/person.

Transportation: 9-passenger station wagons from Hertz, $12/day plus 12¢/mile (about $3-5/person); and two nights at Volcano House, $12-15/night.

Total cost per person, $45-50 plus meals.

If you are interested and plan to participate, please clip off the lower portion of this page (at the dotted line), sign, and send it with a $5.00 deposit check to D. Mueller-Dombois, Department of Botany, University of Hawaii, 2450 Campus Road, Honolulu 96822.

The deposit is necessary for ensuring the early flight reservations, car rental, and lodging. The money will be refunded in case of insufficient participation.

I intend to participate in the Big Island field trip and enclose herewith $5.00 as a deposit.

_____ _____

Date Signed

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THE HAWAIIAN BOTANICAL SOCIETY was founded in 1924 to "advance the science of Botany in all its applications, encourage research in Botany in all its phases," and "promote the welfare of its members and to develop the spirit of good fellowship and cooperation among them." "Any person interested in the plant life of the Hawaiian Islands is eligible for membership in this Society."

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